Empathic responsiveness of children and adolescents with high-functioning autism spectrum disorder

Scheeren, A.M.; Koot, H.M.; Mundy, P.C.; Mous, L.; Begeer, S.M.

published in
Autism Research
2013

DOI (link to publisher)
10.1002/aur.1299

document version
Publisher's PDF, also known as Version of record

Empathic Responsiveness of Children and Adolescents with High-Functioning Autism Spectrum Disorder

Anke M. Scheeren, Hans M. Koot, Peter C. Mundy, Larissa Mous, and Sander Begeer

Previous studies have shown reduced empathic responsiveness to others' emotions in preschoolers with autism spectrum disorder (ASD) and an intellectual disability. However, age and intelligence may promote children's empathic responsiveness. Therefore, we examined the empathic responsiveness in normally intelligent school-aged children and adolescents with a clinical diagnosis of ASD ($n = 151$) and in a typically developing comparison group ($n = 50$), using structured observations and parent reports. Based on the observations, participants' responses to the emotional displays of an interviewer were surprisingly similar. However, compared with parents from the comparison group, parents of a child with ASD reported significantly fewer empathic responses, particularly when the child received a high score on the Autism Diagnostic Observation Schedule. Even though parents report a reduced empathic responsiveness in school-aged children and adolescents with ASD, it may be difficult to find these empathic limitations during brief observations in a structured setting. ***Autism Res*** *2013, ••: ••–••.* © 2013 International Society for Autism Research, Wiley Periodicals, Inc.

Keywords: autism spectrum disorder; empathy; emotional response; social interaction

Social behavior strongly relies on the fundamental ability to empathize with others (de Waal, 2008). Therefore, it is not surprising that autistic disorder, characterized by a key deficit in social interaction, has been described as an "empathy disorder" (Decety & Meyer, 2008; Gillberg, 1992). Research on empathy in autism spectrum disorder (ASD) has primarily focused on children's conceptual understanding of others' emotions and mental states (for a review on Theory of Mind and autism, see Yirmiya, Erel, Shaked, & Solomonica-Levi, 1998). Comparatively few studies have examined the *behavioral* component of empathy, that is, whether children with ASD behave empathically in response to others' emotions. The present study aims to fill this gap by examining the empathic responsiveness of children and adolescents with and without ASD during social interactions.

The term "empathy" can refer to the ability to infer others' emotions by adopting their perspective (i.e. cognitive empathy; de Waal, 2008) as well as to a congruent emotional response to another's emotion (i.e. affective empathy; Decety & Meyer, 2008; Jones, Happé, Gilbert, Burnett, & Viding, 2010). To date, most research on empathy in ASD has addressed specific cognitive impairments in young children with ASD. These studies have consistently shown that young children with ASD have difficulties understanding others' emotions and mental states (for reviews, see Begeer, Koot, Rieffe, Terwogt, & Stegge, 2008; Yirmiya et al., 1998). However, school-aged children with ASD and a normal intelligence quotient (IQ) show relatively adequate perspective-taking skills and emotion understanding (e.g. Capps, Yirmiya, & Sigman, 1992; Downs & Smith, 2004; Hillier & Allinson, 2002; Scheeren, de Rosnay, Koot, & Begeer, 2013) despite their social interaction problems (e.g. Kasari, Locke, Gulsrud, & Rotheram-Fuller, 2011; Macintosh & Dissanayake, 2006). Hence, children's performances on tests assessing perspective taking or basic emotion understanding may not be predictive of their actual empathic behavior. Moreover, the diagnostic criteria for autistic disorder focus on impairments in social *behavior* rather than social cognition (APA, 2000). Therefore, in addition to highlighting children's understanding of others' emotions and mental states, the study of empathy in ASD should also include observations of children's empathic behavior during social interactions. In the present study, we examined the empathic responsiveness of school-aged children and adolescents with ASD and a normal intelligence using both structured observations and parent reports.

From the VU University Amsterdam, Amsterdam, The Netherlands (A.M.S., H.M.K., L.M., S.B.); Autism Research Amsterdam, Amsterdam, The Netherlands (A.M.S., H.M.K., L.M., S.B.); School of Education, M.I.N.D. Institute, University of California Davis, Davis, California (P.C.M.); University of Sydney, Sydney, New South Wales, Australia (S.B.)

Received December 23, 2012; accepted for publication April 10, 2013

Address for correspondence and reprints: Anke M. Scheeren, Department of Developmental Psychology, VU University Amsterdam, Van der Boechorststraat 1, 1081 BT Amsterdam, The Netherlands. E-mail: a.m.scheeren@vu.nl

Grant sponsor: Stichting Nuts Ohra.
Grant number: SNO-T-0701-116.
Published online in Wiley Online Library (wileyonlinelibrary.com)
DOI: 10.1002/aur.1299

Children's empathic responsiveness in a social context is commonly based on their responses to an experimenter's display of distress. Typically developing 1 year olds generally show increased attention and emotional concern in response to an experimenter's distress (Hutman et al., 2010; Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992). However, even though children with ASD and an intellectual disability are not oblivious to nor actively withdraw from the emotions of others (Corona, Dissanayake, Arbelle, Wellington, & Sigman, 1998; Dissanayake, Sigman, & Kasari, 1996), they tend to look less at the distressed adult, demonstrate less facial expression of emotional concern and provide fewer sympathetic comments when compared to age or IQ-matched peers (Bacon, Fein, Morris, Waterhouse, & Allen, 1998; Hobson, Harris, García-Pérez, & Hobson, 2009; Loveland & Tunali, 1991; Scambler, Hepburn, Rutherford, Wehner, & Rogers, 2007; Sigman, Kasari, Kwon, & Yirmiya, 1992). Furthermore, prospective studies have also revealed poorer empathic responsiveness to other's distress in toddlers with varying intellectual abilities who were later diagnosed with ASD (Hutman et al., 2010; McDonald & Messinger, 2012). In short, previous experimental studies support the existence of a deficit in the empathic responsiveness of young children with ASD and children with ASD and an intellectual disability.

It is currently unclear whether the observed lack of empathic responsiveness discussed earlier can be generalized to school-aged children and adolescents with ASD and a normal intelligence (high-functioning ASD; HFASD). Relatively little is known on the empathic responsiveness of adolescents with ASD as compared with young children with ASD. Parent reports suggest that adolescents with ASD show an overall improvement in empathic responsiveness from middle school to late adolescence (McGovern & Sigman, 2005). In adolescence and adulthood, individuals with ASD even report similar emotional experiences after watching an emotional picture or video as typically developing age mates (Jones et al., 2010; Schwenck et al., 2012; Yirmiya, Sigman, Kasari, & Mundy, 1992). However, an important limitation of these previous studies is that they lack direct observations of the adolescents' behavior in response to someone's distress. Furthermore, previous studies with direct observations of children's empathic behavior often included low-functioning children with ASD, i.e. children with ASD and low IQ. However, a normal IQ may benefit the empathic responsiveness of children with ASD, perhaps to the extent that their presumed impairment disappears ("cognitive compensation"; cf. Yirmiya et al., 1992). Indeed, Bacon *et al*. (1998) failed to show any differences in empathic responsiveness between children with HFASD and a typically developing comparison group (both groups had a mean age of 4, 5 years). Thus, both a normal IQ and older age may promote children's empathic responsiveness. However, these are preliminary conclusions based on small-scale studies that did not include direct observations of the empathic responsiveness of older children and adolescents with HFASD.

In the current study, we examined children's empathic responsiveness in a large sample of children and adolescents with HFASD and typically developing peers by using two different methods. First, participants' behavioral responses to the emotional displays (happiness, sadness and pain) of an interviewer were videotaped and coded. To approximate real-life social situations, the emotional cues of the interviewer were presented as naturally occurring events during the interview. Second, parents were asked to describe the anticipated responses of their child in social situations comparable with the ones used in the interview. Based on previous experimental support for a reduced empathic responsiveness in preschoolers with ASD, we hypothesized that children and adolescents with HFASD would demonstrate fewer empathic responses, both based on observations and parent reports, when compared with a typically developing comparison group. Following the hypothesis that a reduced empathic responsiveness is an autistic trait, we also expected that those children with HFASD and more severe autistic traits would show fewer empathic responses than children with HFASD and relatively mild autistic traits.

Methods

Participants

Children and adolescents with a clinical diagnosis of ASD were recruited via a specialized school for normally intelligent children with ASD for a study addressing a wide range of topics (see also Scheeren et al., 2013; Scheeren, Koot, & Begeer, 2012). The school ethics board approved the study. School admission criteria included an IQ within the normal range and a clinical diagnosis of ASD. The diagnostic classification of ASD in the Netherlands is commonly given by a psychiatrist according to established DSM-IV-TR criteria and based on an elaborate examination, both observations and parent interviews, by multiple experienced clinicians (psychologists, psychiatrists and educationalists). The comparison group without ASD was recruited via public primary and secondary schools.

Of the 214 participants with HFASD, 39 were excluded from the final analysis in the current study because parents did not return the parent questionnaire about their child's empathic responsiveness. Twenty-four more participants with HFASD were excluded from the analysis because of a poor video record ($n = 1$), incomplete IQ assessment ($n = 4$), a verbal receptive IQ under 70 ($n = 3$) and incomplete parent report ($n = 2$) or observation data ($n = 14$). Within the comparison group, 23 of the 73

Table 1. Descriptives for the Three Groups of Participants

	High ADOS group ($n = 56$)		Low ADOS group ($n = 95$)		Comparison group ($n = 50$)		
Child variables	*M (SD)*	*Range*	*M (SD)*	*Range*	*M (SD)*	*Range*	Group differences
Age (in years)	13.0 (2.98)	6.4–18.8	13.7 (2.93)	6.4–18.7	11.6 (2.72)	6.0–16.8	High and Low > C
Receptive verbal IQ	103.4 (12.85)	72–126	106.4 (13.10)	76–132	107.2 (12.22)	85–132	n.s.
Gender (boys; girls) (*n*)	54; 2		76; 19		44; 6		Girls: High < Low
Clinical ASD diagnosis (*n*) (Autism; AS; PDD-NOS)	9; 5; 42		20; 15; 60		0; 0; 0		High and Low > C
Total ADOS (module 3 or 4)	10.2 (2.85)	7–19	3.1 (1.80)	0–6	–	–	High > Low
Total SRS	84.5 (21.18)	36–128	78.2 (23.59)	23–133	31.2 (11.89)	13–63	High and Low > C
Environment variables							
Number living with both biological parents; other (*n*)	46; 10		73; 22		39; 8 (3 miss)		n.s.
Educational level mother[a]	4.7 (1.56)	1–7	4.7 (1.55)	1–7	5.2 (1.73)	2–7	n.s.
Educational level father[a]	4.2 (1.84)	1–7	4.9 (1.61)	1–7	5.0 (1.46)	2–7	High < Low
Level of profession mother[b]	3.0 (1.15)	0–5	3.1 (1.08)	0–5	3.4 (1.31)	0–5	n.s.
Level of profession father[b]	3.1 (0.94)	0–5	3.4 (0.85)	1–5	3.5 (1.01)	2–5	High < C

[a]1 = elementary school; 2 = lower professional; 3 = middle secondary; 4 = middle professional; 5 = higher secondary; 6 = higher professional; 7 = academic education.

[b]0 = no profession; 1 = elementary; 2 = lower; 3 = middle; 4 = higher; 5 = academic level.

M, mean; *SD*, standard deviation; High, high ADOS group with HFASD; Low, low ADOS group with HFASD; C, typically developing comparison group; n.s., no significant group differences; ASD, autism spectrum disorder; AS, Asperger's syndrome; PDD-NOS, pervasive developmental disorder-not otherwise specified; ADOS, Autism Diagnostic Observation Schedule; SRS, Social Responsiveness Scale; HFASD, high-functioning ASD; IQ, intelligence quotient.

participants had to be excluded from the final analysis because of a missing parent questionnaire ($n = 16$), a poor video record ($n = 1$), incomplete observation ($n = 1$), incomplete IQ assessment ($n = 1$), or a high level of autistic characteristics as indicated by a high score (>70) on the parent version of the Social Responsiveness Scale ($n = 4$; SRS; Constantino & Gruber, 2007). All parents of the final sample of 50 children (44 boys; 6 girls) in the comparison group confirmed that their child had no ASD diagnosis.

The final group of participants with HFASD consisted of 151 children and adolescents (130 boys; 21 girls) with a clinical diagnosis of autistic disorder ($n = 29$), Asperger's disorder ($n = 20$) or pervasive developmental disorder-not otherwise specified (PDD-NOS; $n = 102$). Participants with HFASD were also assessed with the Autism Diagnostic Observation Schedule, either module 3 or 4 (ADOS; Lord et al., 2000). Based on ADOS scores, we decided to divide our participants with HFASD in two groups: (a) a group with both a clinical diagnosis of ASD and a research diagnosis of ASD, that is, a total ADOS score at/above the ASD cutoff of 7 ($n = 56$; from now on referred to as "high ADOS group"), and (b) a group with a clinical diagnosis of ASD, but an ADOS score below the ASD cutoff ($n = 95$; from now on referred to as "low ADOS group"). Hence, two thirds of our participants did not score at/above the ASD cutoff score of the ADOS. Previous studies also indicated a relatively poor sensitivity of the ADOS to classify individuals with PDD-NOS or identify adults with high-functioning ASD using module 4 (Bastiaansen et al., 2011; Gotham et al., 2008). The high and low ADOS group, however, did not differ in their autism severity ratings as indicated by the SRS, nor in their distribution of clinical diagnoses (see Table 1). The high and low ADOS groups did receive significantly higher SRS scores than the comparison group, indicating that parents of both ADOS groups observed more autistic behaviors in their child compared with parents from the comparison group. The two groups with HFASD did not differ from the comparison group with regard to receptive verbal IQ, gender ratio, or socioeconomic status as indicated by parental education and profession.

Measures

Structured observation of empathic responsiveness. The interviewer showed an emotion on three different occasions during the test procedure. The emotional displays looked like naturally occurring events and were derived from previous studies (e.g. Loveland & Tunali, 1991; Scambler et al., 2007). The emotional displays were adapted to be suitable for a normally intelligent group with a wide age range. All empathy-evoking situations were piloted in children and adolescents with and without HFASD ($n = 52$). During the pilot study, none of the children noticed anything strange about the interviewer's behavior, except for one typically developing adolescent girl. Therefore, the situations were considered as sufficiently realistic.

The interviewer showed each emotion in between tasks that were offered as part of a large battery of psychological tests. The entire test procedure lasted 90 min. Each display of the interviewer's emotion was separated by

approximately 20 min in the test procedure. We developed two different versions of the emotional displays because we reasoned that participants in the same school might talk to each other about the interview. In version A, the interviewer first is invited to the cinema (happy), but then receives a text message that the tickets are sold out (sad). In version B, the interviewer first receives a text message that a friend had an accident (sad), but later hears the friend is going to be fine (happy). By varying the content of the text messages, we reduced the risk that participants would find out that the text messages were part of the assessment. The two versions were counterbalanced across groups.

Response to happiness. At the beginning of the test procedure, the interviewer said that he/she would leave his/her mobile phone on because he/she was expecting an important message or call. This announcement would reduce the participant's surprise as the interviewer pretended to check a text message on the phone. The interviewer displayed happiness to the participant by pretending to receive a positive text message. Depending on the version of the interview, the interviewer either said: "Oh, that's nice [prompt 1]. My friend invites me to the cinema tonight [prompt 2]," or: "Oh, that's good [prompt 1]. My friend is going to be fine. He/she can leave the hospital [prompt 2]." Between the first and second prompt, the interviewer paused for 2 sec. The interviewer showed a happy facial expression corresponding to the emotional content of the text message and looked at the participant.

Response to sadness. The interviewer displayed sadness by pretending to receive a negative text message on his/her phone. Depending on the version of the interview, the interviewer either said: "Oh, that's a shame [prompt 1]. My friend tells me the tickets for the movie are sold out [prompt 2]," or: "Oh, that's bad [prompt 1]. My friend had a bike accident. He/she broke an arm [prompt 2]." Between the first and second prompt, the interviewer paused for 2 sec. The interviewer showed a sad facial expression and looked at the participant.

Response to pain. The interviewer displayed distress by pretending to have neck pain. The interviewer would rub his/her neck, have a distressed facial expression and moan, while not looking at the participant. After 10 sec, the interviewer would give a second prompt by saying: "I had neck pain for a while."

Parent reports of empathic responsiveness. Empathy vignettes were modeled after the empathy-evoking situations during the interview and were used to assess parental views on the empathic responsiveness of their child. Each vignette described a social situation that resembled one of the empathy-evoking situations during the interview. In the vignette, the emotions were displayed by a teacher because this resembled the situation with the adult interviewer as closely as possible. After each vignette, parents were asked to describe the child's anticipated response. They were instructed to write down the most probable response, but they were free to report as many responses as they wished. Instructions and the vignettes are shown in the Appendix S1.

Peabody Picture Vocabulary Test-III-NL. The Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 2004) assesses receptive vocabulary and is highly correlated with more general measures of verbal IQ (Hodapp & Gerken, 1999). Based on the PPVT, participants received a receptive verbal IQ score standardized for age.

ADOS-Generic. The ADOS (Lord et al., 2000) is a semi-structured diagnostic observation measure to assess the presence and severity of ASD-specific impairments in social reciprocity, communication, fantasy, and repetitive interests and behaviors. The ADOS interviewer uses playful activities (e.g. reading a story book) and topics of discussion (e.g. peer problems) to assess the sociocommunicative abilities of the child. Each of the child's behaviors is rated on a three-point-scale (0 = normal behavior; 1 = slightly abnormal behavior; 2 = clearly abnormal behavior). Items in the social reciprocity domain and the communication domain are added to make up a total ADOS score. An ADOS score of 7 or higher is indicative of an ASD. The ADOS has excellent internal consistency, interrater reliability, test–retest reliability and discriminant validity (Lord et al., 2000).

Procedure. After receiving informed consent from parents and participants themselves (if 12 years or older), each participant was individually tested at school. The test procedure involved a full battery of tests (see also Scheeren et al., 2013), including the structured observation of empathic responsiveness. Interviewers were 14 trained graduate students in psychology, health science or medicine. It was not possible to keep the interviewers blind to the child's clinical status because the location of testing gave it away. However, all interviews were videotaped and transcribed, and coded by three graduate students who were blind to the clinical status and the ADOS scores of the participants. After children participated in the study, their parents received a booklet of questionnaires at home concerning their child's behavior. This booklet also contained the empathy vignettes discussed in the present study.

Coding

Structured observation of empathic responsiveness. Participants' responses to each prompt of the interviewer during the empathy-evoking situations (2 prompts × 3 situations = 6 responses in total) were coded from video

Table 2. Categories of Responses Obtained from Structured Observations and Parent Reports

Category	Definition	Examples of responses to other's emotional states: Happiness (e.g. going to the movies)	Sadness (e.g. friend broke an arm)	Pain (e.g. neck pain)
Empathic response	Child gives a relevant verbal response including an empathic reference to the other's emotional state, or offers solutions to alleviate the other's distress.	– "That sounds like fun." – "That's nice."	– "I'm sorry to hear that." – "Would you like to call your friend?"	– "Are you okay?" – Offering or getting help to alleviate the pain
Relevant response	Child gives a relevant verbal response, but response does not include an empathic reference to the other's emotional state or solutions to alleviate the other's distress.	– "Which movie?"	– "I broke my arm once."	– "I have that after playing video games."
Confirmatory response	Child briefly confirms that he/she has heard the other person.	– Nodding, smiling – "Ok," "Yes"	– Nodding – "Ok," "Yes"	– Nodding – "Ok," "Yes"
Attention without response	Child attends to the other person, but does not give a response.	– Looking, but no response	– Looking, but no response	– Looking, but no response
No response or irrelevant response	Child does not attend or respond to the other person, or gives an irrelevant or inappropriate response.	– No attention or response – "When do we have a break?"	– No attention or response – "What kind of phone is that?"	– No attention or response – Laughing

recording into five different and mutually exclusive response categories containing both verbal and nonverbal behaviors (see Table 2), based on coding schemes of Loveland and Tunali (1991) and Bacon et al. (1998). For each of the five response categories, a proportion score was calculated, where the number of each type of response (range: 0–6) was divided by the total number of responses (six). For instance, if a participant showed two empathic responses during the interview, this resulted in a proportion score of 2/6 = 0.33. Coders of the children's responses to the interviewer were three graduate students who were not informed about the children's diagnoses and ADOS scores. Coders 1 and 2, who were responsible for 88% of all coding of the structured observations, double-coded 30 participants (coder 1 and 3: 10 participants). Exact agreement between coder 1 and coder 2 on children's observed responses ranged between 79% and 90% (coder 1 and 3: 60–90%), with kappa's ranging from 0.68 to 0.85 (adequate to good agreement).

Parent reports of empathic responsiveness. Parent reports of the child's empathic responses were assigned to the same five response categories that were used for the structured observation. The frequency of each type of response was tallied across the vignettes. Then a proportion score was calculated, where the number of each type of response was divided by the total number of responses. For instance, if a parent reported three empathic responses of a total of five responses, this resulted in a proportion score of 3/5 = 0.60. Coders 1 and 2 double-coded the parent reports of 30 participants. Exact agreement ranged between 97% and 100%, with the three computed kappa's showing a perfect agreement of 1.00.

Manipulation check. At the end of the test session, each participant was asked whether he/she had noticed anything unusual during the interview. None of the participants stated to have noticed anything unusual about the interviewer's behavior.

Results

Control Analyses

First, we checked whether there was a bias in the responses to the 14 different interviewers. A multiple analysis of variance was run, with interviewer as fixed factor and proportion scores of the five response categories as dependent variables (i.e. proportion of each type of response compared with total number of responses). No significant differences were found in responses to the interviewers (all $Ps > 0.10$) except for one interviewer (J) receiving significantly more empathic responses than two other interviewers (B and A). This was likely due to the older age of J's participants with HFASD ($M = 17.6$ years, $n = 5$) compared with the participants with HFASD of B. ($M = 13.5$ years, $n = 10$) and A ($M = 12.7$ years, $n = 10$). However, removing J's participants from the analyses yielded the same results; therefore, it was decided to keep them.

Second, we tested whether the three emotional displays (happiness, sadness, and pain) differed in proportion of elicited empathic responses. Sadness generally evoked more empathic responses ($M = 0.20$) than happiness ($M = 0.13$; $t(198) = 3.59$, $P < 0.001$) or pain ($M = 0.14$; $t(193) = 2.66$, $P < 0.01$), which is in line with recent reports (Bandstra, Chambers, McGrath, & Moore, 2011).

Table 3. Mean Proportion Scores and Standard Deviations of Each Response Type for Both the Structured Observation and Parent Report of Empathic Responsiveness

	High ADOS group ($n = 56$)	Low ADOS Group ($n = 95$)	Comparison group ($n = 50$)	Group differences (MANCOVA)
Structured observation	*M (SD)*	*M (SD)*	*M (SD)*	
Empathic response	0.12 (0.16)	0.18 (0.19)	0.13 (0.15)	n.s.
Relevant response	0.22 (0.24)	0.23 (0.20)	0.19 (0.17)	n.s.
Confirmatory response	0.17 (0.17)	0.16 (0.17)	0.20 (0.15)	n.s.
Attention without response	0.25 (0.25)	0.27 (0.21)	0.34 (0.18)	n.s.
No or irrelevant response	0.23 (0.23)	0.16 (0.19)	0.14 (0.17)	High > C
Parent report				
Empathic response	0.41 (0.33)	0.61 (0.30)	0.78 (0.24)	High < Low < C
Relevant response	0.27 (0.23)	0.22 (0.22)	0.17 (0.21)	High > C
Confirmatory response	0.02 (0.06)	0.03 (0.07)	0.00 (0.03)	n.s.
Attention without response	0.15 (0.28)	0.07 (0.17)	0.01 (0.07)	High > Low and C
No or irrelevant response	0.15 (0.19)	0.07 (0.14)	0.04 (0.10)	High > Low and C

ADOS, Autism Diagnostic Observation Schedule; MANCOVA, multiple analysis of covariance; *M*, mean; *SD*, standard deviation; n.s., no significant group differences; High, high ADOS group with high-functioning ASD; Low, low ADOS group with HFASD; C, typically developing comparison group.

Separate analyses within each of the three participant groups showed that the interviewer's sadness generated more empathic responses than happiness ($P < 0.05$) and pain ($P < 0.05$) in the comparison group, but these differences in empathic responses were nonsignificant in the high ADOS group, albeit in the same direction. Within the low ADOS group, participants also responded with significantly more empathic responses to the interviewer's sadness than happiness ($P < 0.05$), but the difference between sadness and pain was nonsignificant.

Although the two versions of emotional displays were counterbalanced across groups, we also examined whether version affected the empathic responsiveness of the participants. For participants in the comparison group and the high ADOS group, proportion of empathic responses did not significantly differ between the two versions (all *Ps* > 0.10). Hence, the cinema story elicited as many empathic responses as the story about the friend's bike accident. However, within the low ADOS group, the story about the bike accident evoked significantly more empathic responses than the cinema story.

Finally, to check for associations between participants' empathic responsiveness and their age and receptive verbal IQ, we calculated Pearson correlations between the proportion of empathic responses, and participants' age and receptive verbal IQ. Within the comparison group, children's age was positively and significantly associated with observed empathic responses ($r = 0.33$, $P < 0.05$), while the association with parent-reported empathic responses approached significance ($r = 0.27$, $P < 0.10$). Thus, older participants in the comparison group generally responded more empathically than younger participants. The low ADOS group also showed a positive correlation between age and observed empathic responsiveness ($r = 0.29$, $P < 0.01$), but not between age and parent reported empathy ($r = 0.15$; $P > 0.10$). Within the high ADOS group, age was not significantly correlated with participants' empathic responsiveness in the structured observation ($r = 0.01$; $P > 0.10$) nor parent reports ($r = 0.07$; $P > 0.10$). No significant correlations were found between receptive verbal IQ and empathic responsiveness for either of three groups (all *P*s > 10).

Structured Observation of Empathic Responsiveness

A multiple analysis of covariance (MANCOVA) with group (high ADOS group, low ADOS group and comparison group) as fixed factor, proportion scores of the five response categories as dependent variables (proportion of each type of response compared to total number of responses) and age as a covariate showed no main effect of group on the proportion of empathic responses. While 48% of the participants in the high ADOS group showed at least one or more empathic responses during the interview, this was also true for 59% of the low ADOS group and 52% of the comparison group. In fact, group effects were not found on any of the response categories except for the response category "no response or irrelevant response" ($F(1, 199) = 3.69$, $P < 0.05$, *partial* $\eta^2 = 0.04$). This group effect was followed up by post hoc Bonferroni-corrected tests, which revealed that the high ADOS group more frequently displayed no or irrelevant responses than participants from the comparison group ($P < 0.05$) (see Table 3). No significant difference was noted in this response category between the high and the low ADOS group, and the low ADOS group and comparison group.

Parent Reports of Empathic Responsiveness

MANCOVAs on parent reports of their children's empathic responsiveness demonstrated a main effect of

group on proportion of empathic responses ($F(1, 199) = 22.59$, $P < 0.001$, *partial* $\eta^2 = 0.19$), relevant responses ($F(1, 199) = 4.28$, $P < 0.05$, *partial* $\eta^2 = 0.04$), attention without response ($F(1, 199) = 7.10$, $P < 0.01$, *partial* $\eta^2 = 0.07$) and nonresponses or irrelevant responses ($F(1, 199) = 8.19$, $P < 0.001$, *partial* $\eta^2 = 0.08$). Subsequent Bonferroni-corrected post hoc analyses indicated that parents expected their child with a high ADOS score to show fewer empathic responses than children from the low ADOS group ($P < 0.001$), who in turn were expected to show fewer empathic responses than the comparison group ($P < 0.01$), see Table 3. To illustrate these differences, 23% of the parents with a child from the high ADOS group did not expect any empathic response compared with 10% of parents in the low ADOS group and only 2% in the comparison group. Moreover, 16% of parents with a child from the high ADOS group expected four or more empathic responses compared with 40% in the low ADOS group and 62% in the comparison group. Furthermore, parents with a child in the high ADOS group anticipated significantly more relevant responses than parents in the comparison group ($P < 0.05$). Also, compared with both other groups, parents with a child in the high ADOS group reported more often that their child would pay attention, but would not respond (low ADOS: $P < 0.05$; comparison group: $P < 0.01$) or would show nonresponses, irrelevant or inappropriate responses (low ADOS: $P < 0.01$; comparison group: $P < 0.001$).

Discussion

Empathic responsiveness of a large sample of normally intelligent children and adolescents with a diagnosis of ASD (HFASD) and typically developing peers was systematically examined using structured observations and parent reports. Counter to our expectation, observed responses to the emotional states of an interviewer were largely comparable for participants with and without HFASD. However, children's empathic responsiveness as described by parents was substantially reduced in the group of participants with HFASD and more severe autistic traits (as indicated by a high ADOS score) both compared with the participants with relatively mild autistic traits and the comparison group.

Previous experimental studies have consistently demonstrated reduced attention and concern toward distressed adults in children with ASD and an intellectual disability compared with a matched comparison group (Bacon et al., 1998; Scambler et al., 2007; Sigman et al., 1992). Considering these results, it was surprising to see how similar children's responses were during the structured observation. Children and adolescents with and without HFASD equally often provided an empathic response, a relevant response or a brief response indicating that they had listened to the interviewer. They also equally often paid attention to the interviewer after his/her emotional display. A modest group difference was only noticed between the comparison group and the group with more severe ASD symptoms (ADOS score ≥7), where the latter group showed more nonresponses, irrelevant and inappropriate responses. For example, some participants with HFASD commented on the interviewer's phone (e.g. "What type of phone do you have?") instead of responding to the emotion displayed by the interviewer.

Overall, our findings suggest that when circumstances are kept relatively simple (a dyadic interaction with an adult, display of one basic emotion), children with and without HFASD may behave similarly in response to the emotional states of an unfamiliar adult. Our observation data also correspond with self-reports of adequate emotional responses in adolescents and adults with ASD (Dziobek et al., 2008; Jones et al., 2010; Schwenck et al., 2012). While a normal IQ may serve as a protective factor against an impaired empathic responsiveness in children and adolescents with HFASD (Yirmiya et al., 1992), the current lack of association between receptive verbal IQ and empathic responsiveness suggests that intellectual abilities may no longer add meaningfully to variance in empathic responsiveness once above a particular threshold. Age may be a better explanation for the apparent contrast with previous findings of a reduced empathic responsiveness in preschoolers with ASD. School-aged children and adolescents with ASD may have continued to develop their empathic responsiveness, as has already been suggested by longitudinal studies using parent reports (McGovern & Sigman, 2005). Indeed, in our study, older participants tended to show more empathic responses. However, a closer examination showed that this age effect was present within the comparison group and the low ADOS group, but missing within the group of participants with HFASD and high ADOS scores. This suggests that the empathic responsiveness of children and adolescents with HFASD and more severe autistic traits may be less sensitive to developmental growth.

Parent reports clearly pointed to a reduced everyday empathic responsiveness in children and adolescents with HFASD, particularly when they showed more severe autistic behaviors as indicated by a high ADOS score. This generally agrees with previous parent reports (Hudry & Slaughter, 2009; Johnson, Filliter, & Murphy, 2009). However, it should also be noted that even among children and adolescents with HFASD, approximately half of all parent-reported responses were coded as empathic responses (41% in high ADOS group and 61% in low ADOS group). Apparently, most parents with a child with HFASD expect at least some adequate empathic responses

from their child, although substantially less so when compared with 78% of all responses reported by parents in the comparison group.

Although parents reported a reduced empathic responsiveness in children and adolescents with HFASD, it appears difficult to find these empathic limitations during brief observations in an experimental setting. Both of these findings reveal something about children's empathic responsiveness, and the unexpected discrepancy between these findings is informative on its own. Possibly, parents rely on their full range of experiences with their child to predict their child's responses to others' emotions, whereas the structured observations of children's empathic behavior may be more strongly impacted by contextual (interviewer) or temporary factors (participant's mood). The observation measure may not have been sensitive enough to detect differences in empathic responsiveness between those with (mild forms of) ASD and those without. Also, responsiveness of children with ASD may increase because of the lack of distraction during an individual interview and the relatively explicit (verbal) cues of an interviewer. We therefore warrant caution when using standardized observations of a child's empathic responsiveness during a semistructured interaction with an unfamiliar adult (e.g. a psychiatrist). Explicit empathic responses from a normally intelligent school-aged child or adolescent to an adult may be quite rare and, importantly, do not refute an ASD diagnosis.

Even though parents generally provide reliable and valid information about their child's behavior (Dirks & Boyle, 2010; Verhulst, Koot, & Van der Ende, 1994), the explicit empathy vignettes may have elevated parental expectations of their child's empathic behavior, leading them to report disproportionately many empathic responses. This may be especially true for parents of a typically developing child, as they have no diagnostic reason to believe that their child's empathic responsiveness is hampered. On the other hand, even though parents of a child with HFASD were unaware of the child's ADOS score, parents of a child with a high ADOS score still reported significantly fewer empathic responses than parents of a child with a low ADOS score. Thus, parental reports of their child's empathic responsiveness seem to reflect meaningful differences in children's social functioning.

Judgments of the empathic responsiveness of participants were partly based on the verbal content of their responses, although nonverbal responses such as helping and looking behavior were also coded. The verbal communication by the interviewer likely raised the necessity as well as the functionality of a verbal rather than a nonverbal response, yet we cannot rule out that some participants may have experienced empathy without expressing it verbally to the interviewer. Subtle impairments in the timing or nonverbal empathic responses of children with HFASD might still exist, but these were not targeted in the present study. Also, the unfamiliarity and the authority of the interviewer may have inhibited children's overt empathic responsiveness. Peers likely evoke more empathic responses in a child than an experimenter or a teacher because of increased familiarity and similarity (Preston & de Waal, 2002; Saarni, 2001). Therefore, in future studies, it would be informative to examine both explicit and implicit cues of empathy as well as children's empathic responses to different social partners. Our findings also emphasize the impact of methodology on the degree of children's empathic responsiveness. Children's empathic responses in a test situation may not reflect their everyday empathic responsiveness, nor do parental perspectives on their child's empathic responsiveness reflect the child's responses to an unknown adult in a test situation. Therefore, measures of empathic responsiveness should ideally combine the best of both methods (unbiased perspective and high ecological validity) in order to get an idea of a child's true level of empathic responsiveness. An objective observation of children's empathic behavior in unstructured social situations (e.g. play ground) may be a promising method.

Acknowledgments

The authors would like to thank all children and adolescents and their parents for participating in this study, with special thanks to the Berg en Boschschool. This study was financially supported by Stichting Nuts Ohra [SNO-T-0701-116].

References

American Psychiatric Association. (2000). Diagnostic and statistical manual of mental disorders, 4th ed. text revision). Washington, DC: American Psychiatric Association.

Bacon, A.L., Fein, D., Morris, R., Waterhouse, L., & Allen, D. (1998). The responses of autistic children to the distress of others. Journal of Autism and Development Disorders, 28, 129–142.

Bandstra, N.F., Chambers, C.T., McGrath, P.J., & Moore, C. (2011). The behavioural expression of empathy to other's pain versus other's sadness in young children. Pain, 152, 1074–1082.

Bastiaansen, J.A., Meffert, H., Hein, S., Huizinga, P., Ketelaars, C., et al. (2011). Diagnosing Autism Spectrum Disorders in adults: The use of Autism Diagnostic Observation Schedule (ADOS) module 4. Journal of Autism and Developmental Disorders, 41, 1256–1266.

Begeer, S., Koot, H.M., Rieffe, C., Terwogt, M.M., & Stegge, H. (2008). Emotional competence in children with autism: Diagnostic criteria and empirical evidence. Developmental Review, 28, 342–369.

Capps, L., Yirmiya, N., & Sigman, M. (1992). Understanding of simple and complex emotions in non-retarded children with

autism. Journal of Child Psychology and Psychiatry and Allied Disciplines, 33, 1169–1182.
Constantino, J.N., & Gruber, C.P. (2007). Social responsiveness scale. Los Angeles, CA: Western Psychological Services.
Corona, R., Dissanayake, C., Arbelle, S., Wellington, P., & Sigman, M. (1998). Is affect aversive to young children with autism? Behavioral and cardiac responses to experimenter distress. Child Development, 60, 1494–1502.
de Waal, F.B.M. (2008). Putting the altruism back into altruism: The evolution of empathy. Annual Review of Psychology, 59, 279–300.
Decety, J., & Meyer, M. (2008). From emotion resonance to empathic understanding: A social developmental neuroscience account. Development and Psychopathology, 20, 1053–1080.
Dirks, M.A., & Boyle, M.H. (2010). The comparability of mother-report structured interviews and checklists for the quantification of youth externalizing symptoms. Journal of Child Psychology and Psychiatry, 51, 1040–1049.
Dissanayake, C., Sigman, M., & Kasari, C. (1996). Long-term stability of individual differences in the emotional responsiveness of children with autism. Journal of Child Psychology and Psychiatry, 37, 461–467.
Downs, A., & Smith, T. (2004). Emotional understanding, cooperation, and social behavior in high-functioning children with autism. Journal of Autism and Developmental Disorders, 34, 625–635.
Dunn, L.M., & Dunn, L.M. (2004). Peabody picture vocabulary test (ppvt)-iii-nl. Amsterdam: Hartcourt Test Publishers.
Dziobek, I., Rogers, K., Fleck, S., Bahnemann, M., Heekeren, H.R., et al. (2008). Dissociation of cognitive and emotional empathy in adults with Asperger Syndrome using the multifaceted empathy test (MET). Journal of Autism and Developmental Disorders, 38, 464–473.
Gillberg, C.L. (1992). The Emanuel Miller Memorial Lecture 1991. Autism and autistic-like conditions: Subclasses among disorders of empathy. Journal of Child Psychology and Psychiatry and Allied Disciplines, 33, 813–842.
Gotham, K., Risi, S., Dawson, G., Tager-Flusberg, H., Joseph, R., et al. (2008). A replication of the Autism Diagnostic Observation Schedule (ADOS) revised algorithms. Journal of the American Academy of Child and Adolescent Psychiatry, 47, 642–651.
Hillier, A., & Allinson, L. (2002). Understanding embarrassment among those with autism: Breaking down the complex emotion of embarrassment among those with autism. Journal of Autism and Developmental Disorders, 32, 583–592.
Hobson, J.A., Ruth, H., García-Pérez, R., & Hobson, R.P. (2009). Anticipatory concern: A study in autism. Developmental Science, 12, 249–263.
Hodapp, A.F., & Gerken, K.C. (1999). Correlations between scores for Peabody Picture Vocabulary Test-III and the Wechsler Intelligence Scale for Children-III. Psychological Reports, 84, 1139–1142.
Hudry, K., & Slaughter, V. (2009). Agent familiarity and emotional context influence the everyday empathic responding of young children with autism. Research in Autism Spectrum Disorders, 3, 74–85.
Hutman, T., Rozga, A., DeLaurentis, A.D., Barnwell, J.M., Sugar, C.A., & Sigman, M. (2010). Response to distress in infants at risk for autism: A prospective longitudinal study. Journal of Child Psychology and Psychiatry, 51, 1010–1020.
Johnson, S.A., Filliter, J.H., & Murphy, R.R. (2009). Discrepancies between self- and parent-perceptions of autistic traits and empathy in high functioning children and adolescents on the autism spectrum. Journal of Autism and Developmental Disorders, 39, 1706–1714.
Jones, A.P., Happé, F.G.E., Gilbert, F., Burnett, S., & Viding, E. (2010). Feeling, caring, knowing: Different types of empathy deficit in boys with psychopathic tendencies and autism spectrum disorder. Journal of Child Psychology and Psychiatry, 51, 1188–1197.
Kasari, C., Locke, J., Gulsrud, A., & Rotheram-Fuller, E. (2011). Social networks and friendships at school: Comparing children with and without ASD. Journal of Autism and Developmental Disorders, 41, 533–544.
Lord, C., Risi, S., Lambrecht, L., Cook, E.H., Leventhal, B.L., et al. (2000). The Autism Diagnostic Observation Schedule—Generic: A standard measure of social and communication deficits associated with the spectrum of autism. Journal of Autism and Developmental Disorders, 30, 205–223.
Loveland, K.A., & Tunali, B. (1991). Social scripts for conversational interactions in autism and Down syndrome. Journal of Autism and Developmental Disorders, 21, 177–186.
Macintosh, K., & Dissanayake, C. (2006). A comparative study of the spontaneous social interactions of children with high-functioning autism and children with Asperger's disorder. Autism, 10, 199–220.
McDonald, N.M., & Messinger, D.S. (2012). Empathic responding in toddlers at risk for an autism spectrum disorder. Journal of Autism and Developmental Disorders, 42, 1566–1573.
McGovern, C.W., & Sigman, M. (2005). Continuity and change from early childhood to adolescence in autism. Journal of Child Psychology and Psychiatry, 46, 401–408.
Preston, S.D., & de Waal, F.B.M. (2002). Empathy: Its ultimate and proximate bases. Behavioral and Brain Sciences, 25, 1–72.
Saarni, C. (2001). Cognition, context, and goals: Significant components in social-emotional effectiveness. Social Development, 10, 125–129.
Scambler, D.J., Hepburn, S., Rutherford, M.D., Wehner, E.A., & Rogers, S.J. (2007). Emotional responsivity in children with autism, children with other developmental disabilities, and children with typical development. Journal of Autism and Developmental Disorders, 37, 553–563.
Scheeren, A.M., de Rosnay, M., Koot, H.M., & Begeer, S. (2013). Rethinking Theory of Mind in high-functioning autism spectrum disorder. Journal of Child Psychology and Psychiatry, 54, 628–635.
Scheeren, A.M., Koot, H.M., & Begeer, S. (2012). Social interaction style of children and adolescents with high-functioning autism spectrum disorder. Journal of Autism and Developmental Disorders, 42, 2046–2055.
Schwenck, C., Mergenthaler, J., Keller, K., Zech, J., Salehi, S., et al. (2012). Empathy in children with autism and conduct disorder: Group-specific profiles and developmental aspects. Journal of Child Psychology and Psychiatry, 53, 651–659.

Sigman, M., Kasari, C., Kwon, J.H., & Yirmiya, N. (1992). Responses to the negative emotions of others by autistic, mentally retarded, and normal children. Child Development, 63, 796–807.

Verhulst, F.C., Koot, H.M., & Van der Ende, J. (1994). Differential predictive value of parents' and teachers' reports of children's problem behaviors: A longitudinal study. Journal of Abnormal Child Psychology, 22, 531–546.

Yirmiya, N., Erel, O., Shaked, M., & Solomonica-Levi, D. (1998). Meta-analyses comparing theory of mind abilities of individuals with autism, individuals with mental retardation, and normally developing individuals. Psychological Bulletin, 124, 283–307.

Yirmiya, N., Sigman, M., Kasari, C., & Mundy, P. (1992). Empathy and cognition in high-functioning children with autism. Child Development, 63, 150–160.

Zahn-Waxler, C., Radke-Yarrow, M., Wagner, E., & Chapman, M. (1992). Development of concern for others. Developmental Psychology, 28, 126–136.

Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Figure S1. Proportion of empathic responses for each group and each measure of empathic responsiveness.
Appendix S1. Vignettes used for parent reports of children's empathic responsiveness.